Comments:

Applicant wishes to thank the Examiner for her detailed comments. As Examiner has grouped her actions by sections, Applicant will respond to these sections one by one.

Drawings:

Examiner has stated that the drawings are objected to because characters "**16**" and "**19**" have both been used to designate "cavity".

Applicant has been through the specification in detail, and the reference number "**19**" has only been used to designate a "medium of variable index of refraction" (page 9, line 11, and page 11, line 8) and has never been used to designate a "cavity". The medium **19** does indeed fill the cavity **16**, and generally occupies much of the same space as indicated by the element numbers in the figures, but the two element numbers have never been used to designate the same element of "cavity".

Applicant therefore respectfully requests that the Examiner withdraw the objection to the drawings.

In the specification:

The abstract of the disclosure has been objected to because it contains more than one paragraph. This has been corrected in the revised abstract

Claim objections:

Examiner has stated that Claims 2, 3, 4, 7, 8, 9, and 11-12 are objected to because of the following informalities. Each of these objections shall be addressed by section number in turn:

(1) Examiner has stated that "the phrase "a cavity" recited in claims 2, 3, 7 and 8 is indefinite since it is not clear how does it relate to the "cavity" recited in their respective based claim."

Claims 2 and 3 have been amended to include "said cavity" thus showing that the cavity recited is the same as in base Claim 1. Applicant respectfully requests that the objection to these claims be withdrawn.

As to Claims 7 and 8, they are dependent on base claim 6, which does not use the term "cavity", thus the reference to "a cavity" is appropriate. Applicant

respectfully asserts that the claims are not indefinite as they stand and requests that the objection to these claims be withdrawn.

(2) Examiner states that "the phrase "the ITU grid" recited in claims 4 and 9 is indefinite since it lacks a proper antecedent basis from their respective based claim."

It is thought that the Examiner's objection here is to the use of the word "the" in the phrase "the ITU grid" and would prefer "an ITU grid" to be used instead (emphasis added).

As recited in the specification, the International telecommunications Union (ITU) has established a set of standardized frequencies which is known as the ITU grid (see page 8, lines 3-12). As such, it is the standard in the field, and well known to those in the field, and always referred to as "the ITU grid", in the same way that one refers to "the Encyclopedia Britannica" or "the Equator". Just as one does not refer to "an Equator", if trying to reference that particular geographical marking on the Earth, it would be confusing and really make no sense to refer to "an ITU grid" instead of "the ITU grid". Examiner is reminded that not every instance of the word "the" is used to establish that the element has an antecedent. In this case, it is used as part of the term itself. Therefore Applicant respectfully asserts that the term as used is appropriate as it stands and requests that the objection be withdrawn.

(3) Examiner has stated that "the phrase "said wavelength reference is the ITU grid" recited in claim 9 is confusing since it is not clear if the wavelength reference or the wavelength standard is the ITU grid."

The ITU grid, which is the industry standard, is here being used as the wavelength reference. There is no contradiction in the terms, as the reference could possibly have been chosen as something other than the ITU grid, but one choice is to use this standard as the reference. Therefore Applicant respectfully asserts that the term as used is appropriate as it stands and requests that the objection be withdrawn.

Claim Rejections –35USC § 112:

Examiner has stated that "Claims 11-12 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement....The specification fails to teach the support for the "filled gas of variable pressure and composition", it only gives support for the filled gas of variable pressure or composition."

Claim 11 has been amended to read "gas of variable pressure or composition."

Claim Rejections –35USC § 102(b):

Examiner has rejected Claims 1, 4, 5, 6, 9, 10, 13 and 14 are rejected under 35 U.S.C. 102(e) as being anticipated by the patent issued to *Ip* (PN. 6,141,130).

Examiner states that "*Ip* teaches a spectral equalizer (100. Figure 1) for multiplexed channels wherein the spectral equalizer comprises a Fabry Perot etalon that is comprised of a pair of partially reflective surfaces (13 and 14) separated by a distance d to form a light transmissive resonating cavity (15). *Ip* teaches that the cavity may be filled with gas wherein by varying the density or composition due to changes in pressure, temperature or humidity the refractive index of the gas can be varied to tune the resonance and anti-resonance wavelengths of the etalon, (please see column 5, lines 20-28). The Fabry Perot etalon creates periodically varying spectral response as shown in Figure 2. *Ip* further teaches that by varying the properties therefore the refractive index of the gas, the Fabry Perot etalon can be tuned to align with predetermined channel spacing such as ITU channel plan that serves as the standard wavelength, (please see column 5. lines 15-19). The gas is then sealed within the cavity so that the refractive index of the gas is fixed, (please see column 5, line 27-30). The spectral equalizer with the Fabry Perot etalon therefore provides a wavelength reference."

Applicant respectfully asserts that there are several errors in the Examiner's statement. *Ip* teaches that the spectral equalizer can be tuned by one of two methods: 1) "the effective distance of the path taken by the light entering the etalon can be varied by changing the dimension d of the cavity" (col. 5, lines 2-5) or 2) "alternately, the input angle of an incident light beam entering the etalon 10 can be adjusted" (col. 5, lines 5-6). "Using either of such tuning techniques, spacing ...can be aligned...with a predetermined channel spacing" (col. 5, lines 11-14).

The following paragraph does mention that "a change in density or composition- due to changes in pressure, temperature or composition...will affect the refractive index of the air or other gases, affecting the resonance ....Thus it is preferred to have the gas sealed or controlled to prevent wavelength drifting" (col.5, lines 25-29). In the *Ip* patent, it is merely acknowledged that changes in the gas pressure or composition can cause drift, but never is it disclosed that this is a method for tuning the output, and specifically tuning it to align with the ITU grid. Besides the recitation of tuning only by changing spacing or angle, further evidence that tuning by gas properties is indicated by the recitation that "the ITU channel plan has a 100 GHZ frequency grid" (col.5, line 16-17). The tuning achieved by gas tuning is more subtle than that achieved by grosser methods, such as angle tuning or plate separation, and thus is much more suited to more recent channel plans of 50 GHz or 25Ghz. Gas tuning is not taught in the *Ip* patent because it is not well suited to the separation of grid lines used by the ITU grid at the time the *Ip* patent was written. *Ip* teaches merely that the cavity must be sealed to prevent frequency drift, but does not teach how to tune frequencies by actively varying the gas pressure or composition.

By contrast, the present invention uses gas tuning actively to establish the resonance and anti-resonance frequency. This is a procedure that must be actively engaged in, and does not come about merely because of the physical principle that index of refraction of a medium is changed by the composition and pressure of that medium, which is all that *Ip* discloses. Aligning wavelengths with the ITU grid is an operation that requires precision and an affirmative action by the user, and Applicant respectfully asserts that this method and apparatus is novel and not anticipated by the cited references.

With regard to claims 5 and 10, Examiner states that "*Ip* teaches that the reflective surfaces (13 and 14) are partially reflective which means they are partially transmissive, (please see column 3, lines 29-30)."

Claims 5 and 10 depend from Claim 1 and 6 and include the inventive features of these claims by their dependence and are likewise assertedly allowable.

With regard to claims 13 and 14, Examiner states that "*Ip* teaches that the gas is sealed within the cavity (15), wherein the cavity as shown in Figure 1 comprises enclosure walls that form sealable enclosure."

Claims 13 and dependent Claim 14 also include the inventive features of wavelength tuning by gas pressure or composition and are likewise assertedly allowable.

Applicant thus respectfully requests that the rejection be withdrawn and Claims 1, 4, 5, 6, 9, 10, 13 and 14 be allowed.

Claim Rejections –35USC § 103:

Examiner has stated that "Claims 2-3 and 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to *Ip* in view of the Japanese Patent *Tachikawa* et al (JP401250833A). ... *Tachikawa* et al in the same field of endeavor teaches an arrangement and method to vary the properties such as pressure or temperature of the gas medium in the cavity of a Fabry Perot etalon wherein a container (3. Figure 1) serves as the enclosure that is filled with the gas surrounds the cavity (2) formed by the reflective plates. By varying the properties of the gas in the container the refractive index of the gas in the cavity is varied so that the etalon is tuned. It would then have been obvious to one skilled in the art to apply the teachings of *Tachikawa* et alto modify the spectral equalizer of *Ip* for the benefit of providing a buffer environment as intermediate means to vary the properties of the gas in the etalon so that the variation of the refractive index of the etalon therefore the tuning of the etalon could be conducted in a more accurately controlled manner."

Applicant respectfully asserts again that there are several errors in the Examiner's statement. As discussed above, *Ip* teaches that the spectral equalizer can be tuned by varying the distance of the path taken by the light entering the etalon, or varying the input angle of an incident light beam entering the etalon 10,

but never is it disclosed that the gas composition or pressure can be used for tuning the output, and specifically tuning it to align with the ITU grid. *Ip* teaches merely that the cavity must be sealed to prevent frequency drift, but does not teach how to tune frequencies by actively varying the gas pressure or composition.

The patent to *Tachikawa* also does not disclose this method or apparatus for tuning spectral output. It merely teaches that gas which has a smaller refractive index than air can be introduced into the gap between plates as a way to suppress drift in the output wavelength. Nowhere does it teach that variations in gas pressure or composition may be used to tune the output. This is merely a way to minimize drift.

As discussed before, the present invention uses gas tuning actively to establish the resonance and anti-resonance frequency. Aligning wavelengths with the ITU grid is an operation that requires precision and an affirmative action by the user and is not engaged in merely to prevent output drift. Applicant respectfully asserts that this method and apparatus is novel and contains elements not taught or contemplated by either of these references, and thus cannot be said to be either anticipated nor obvious over any combination of these references.

Applicant thus respectfully requests that the rejection be withdrawn and Claims 2-3 and 7-8 be allowed.

Examiner has stated that "Claims 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to *Ip* in view of the Japanese Patent *Tachikawa* et al (JP401250833A). *Ip* teaches a spectral equalizer (100, Figure 1) for multiplexed channels wherein the spectral equalizer comprises a Fabry Perot etalon that is comprised of a pair of partially reflective surfaces (13 and 14) separated by a distance d to form a light transmissive resonating cavity (15). *Ip* teaches that the cavity may be filled with gas wherein by varying the density or composition due to changes in pressure, temperature or humidity the refractive index of the gas can be varied to tune the resonance and anti-resonance wavelengths of the etalon. (please see column 5, lines 20-28). ...This reference has met all the limitations of the claims with the exception that it does not teach explicitly to include an enclosure surrounding the cavity that is filled with the gas. *Tachikawa* et al in the same field of endeavor teaches an arrangement and method to vary the properties such as pressure or temperature of the gas medium in the cavity of a Fabry Perot etalon wherein a container (3, Figure 1) serves as the enclosure that is filled with the gas surrounds the cavity (2) formed by the reflective plates. By varying the properties of the gas in the container the refractive index of the gas in the cavity is varied so that the etalon is tuned. It would then have been obvious to one skilled in the art to apply the teachings of *Tachikawa* et alto modify the spectral equalizer of *Ip* for the benefit of providing a buffer environment as intermediate means to vary the properties of the gas in the etalon so that the variation of the refractive index of the etalon therefore the tuning of the etalon could be conducted in more accurately controlled manner."

Applicant respectfully asserts again that there are several errors in the Examiner's statement. As discussed above, *Ip* teaches that the spectral equalizer can be tuned by varying the distance of the path taken by the light entering the etalon, or varying the input angle of an incident light beam entering the etalon 10, but never is it disclosed that the gas composition or pressure can be used for tuning the output, and specifically tuning it to align with the ITU grid. *Ip* teaches merely that the cavity must be sealed to prevent frequency drift, but does not teach how to tune frequencies by actively varying the gas pressure or composition.

The patent to *Tachikawa* also does not disclose this method or apparatus for tuning spectral output. It merely teaches that gas which has a smaller refractive index than air can be introduced into the gap between plates as a way to suppress drift in the output wavelength. Nowhere does it teach that variations in gas pressure or composition may be used to tune the output. This is merely a way to minimize drift.

As discussed before, the present invention uses gas tuning actively to establish the resonance and anti-resonance frequency. Aligning wavelengths with the ITU grid is an operation that requires precision and an affirmative action by the user and is not engaged in merely to prevent output drift. Applicant respectfully asserts that this method and apparatus is novel and contains elements not taught or contemplated by either of these references, and thus cannot be said to be either anti*cip*ated nor obvious over any combination of these references.

Applicant thus respectfully requests that the rejection be withdrawn and Claims 11-12 be allowed.

Double Patenting:

Examiner has stated that "Claims 1-14 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-4, 9, 12-16 and 22 of U.S. Patent No. 6,552,856... A timely filed terminal disclaimer in compliance with 37 CFR 1.32 1(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1. 13 0(b)."

The present application and U.S. Patent No. 6,552,856 to Chen are both assigned to Fibera, Inc., and are thus commonly owned. Additionally, both applications have the same filing date of 9/27/2001, so the duration of each are exactly equal anyway. However, a Terminal Disclaimer is being submitted herewith, and it is assumed that by submission of this Terminal Disclaimer, that the double patenting rejection is now overcome and that the rejection of claims 1-14 will now be withdrawn.

Conclusion:

Applicant has endeavored to put this case into complete condition for allowance. It is thought that the §102 and §103 rejections have also been addressed by amendment or been completely rebutted and that the objections and §112 rejections have all been corrected by amendment. Applicant therefore respectfully asks that the rejections be withdrawn and that allowance of all claims presently in the case now be granted.

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Respectfully Submitted,

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Version with markings to show changes made.

2. The wavelength reference of claim 1, wherein:
said etalon includes an enclosure surrounding [a] said cavity which is filled with gas, and tuning of said etalon is done by variation in the pressure of the gas in [the] said cavity.

3. The wavelength reference of claim 1, wherein:
said etalon includes an enclosure surrounding [a] said cavity which is filled with gas, and tuning of said etalon is done by variation in the composition of the gas in [the] said cavity.

11. A process for making a wavelength reference, comprising the steps of :
A) forming at least one etalon which includes a pair of reflecting surfaces and enclosure walls surrounding a cavity filled with gas of variable pressure [and] or composition, and which produces a medium of variable optical index of refraction;
B) introducing radiation into said etalon, whereby a plurality of equally spaced spectral lines is produced;
C) tuning said etalon by varying said variable optical index of refraction, to align said plurality of spectral lines with an external wavelength standard; and
D) fixing said variable optical index of refraction included in said etalon, so that said spectral line produced remains substantially aligned with said external wavelength standard.